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Lake Seminole, Pinellas County, Florida

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NATIONAL EUTROPHICATION SURVEY

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REPORT
ON
LAKE SEMINOLE
PINELLAS COUNTY
FLORIDA
EPA REGION IV
WORKING PAPER No. 273

WITH THE COOPERATION OF THE
FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

17. KEY WORDS AND DOCUMENT ANALYSIS

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Florida Department of Environmental Regulation for professional involvement and to the Florida National Guard for conducting the tributary sampling phase of the Survey.

Joseph W. Landers, Jr., Secretary of the Department of Environmental Regulation; John A Redmond, former Director of the Division of Planning, Technical Assistance, and Grants; and Dr. Tim S. Stuart, Chief of the Bureau of Water Quality, provided invaluable lake documentation and counsel during the survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

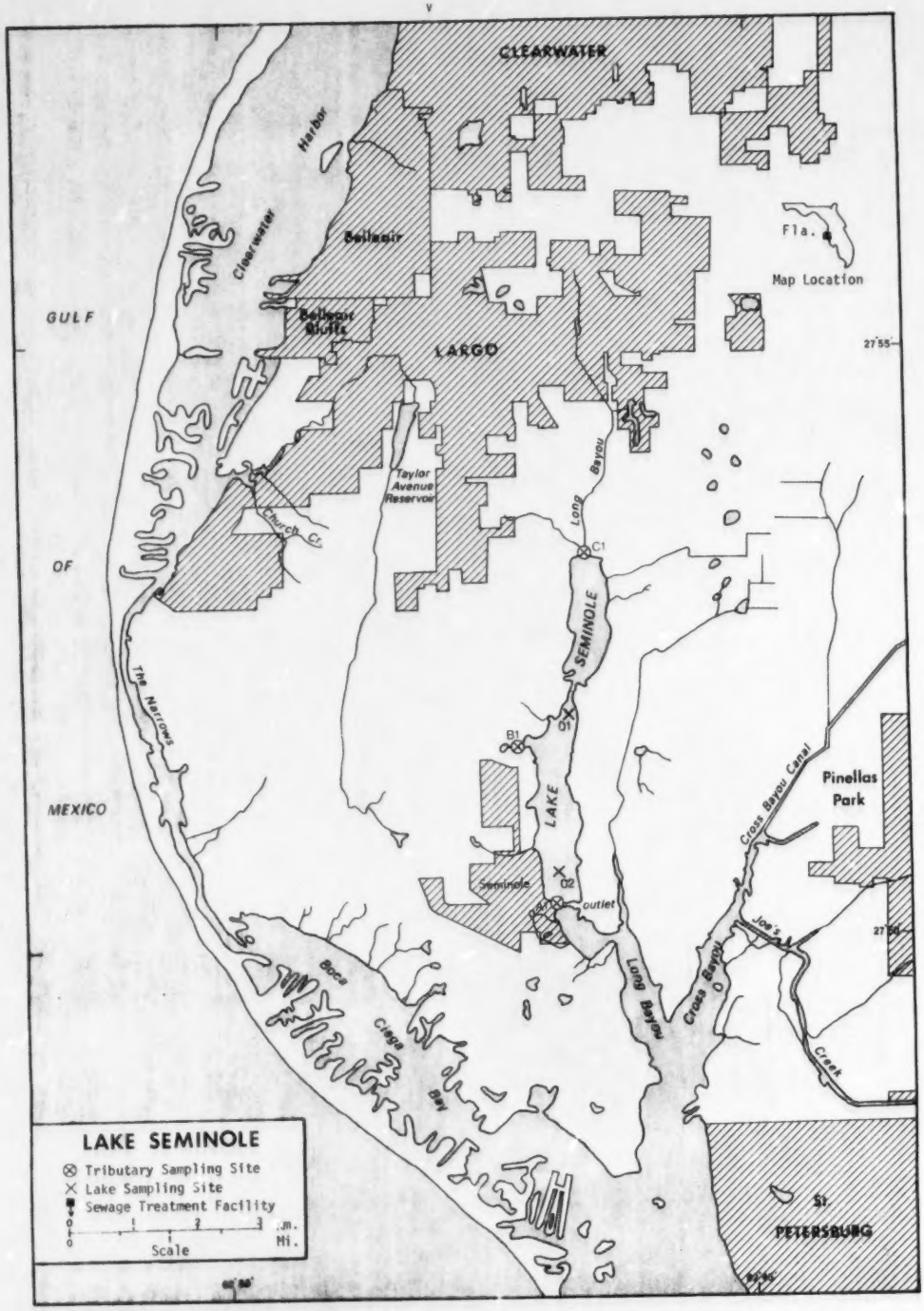
Major General Henry W. McMillan (Retired), then the Adjutant General of Florida, and Project Officer Colonel Hugo F. Windham, who directed the volunteer efforts of the Florida National Guard, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF FLORIDA

LAKE NAME	COUNTY
Alligator	Columbia
Apopka	Lake, Orange
Banana	Polk
Crescent	Flagler, Putnam
Doctors	Clay
Dora	Lake
East Tohopekaliga	Osceola
Effie	Polk
Eloise	Polk
George	Putnam, Volusia
Gibson	Polk
Glenada	Highlands
Griffin	Lake
Haines	Polk
Hancock	Polk
Horseshoe	Seminole
Howell	Orange, Seminole
Istokpoga	Highlands
Jessie	Polk
Jessup	Seminole
Kissimmee	Osceola
Lawne	Orange
Lulu	Polk
Marion	Polk
Minnehaha	Orange
Minneola	Lake
Monroe	Seminole, Volusia
Munson	Leon
Okeechobee	Glades, Hendry, Martin, Okeechobee, Palm Beach
Poinsett	Brevard, Orange, Osceola
Reedy	Polk
Seminole	Jackson, FL; Decatur, Seminole, GA
Seminole	Pinellas
South	Brevard
Talquin	Gadsden, Leon
Tarpon	Pinellas
Thonotosassa	Hillsborough
Tohopekaliga	Osceola
Trout	Lake
Weohyakapka	Polk
Yale	Lake


CLEARWATER
Harbor
Clearwater
Belleair
Belleair Bluffs
LARGO
Fla.
Map Location
GULF
OF
MEXICO
27°55'
Taylor Avenue Reservoir
Church Cr.
Long Bayou
C1
SEMINOLE
LAKE
B1
B2
The Narrows
Cross Bayou Canal
Pinellas Park
Seminole
outlet
Joe's
Boca Ciega Bay
Cross Bayou
Creek
ST. PETERSBURG
LAKE SEMINOLE
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Scale
Km.
Mi.

LAKE SEMINOLE

STORET NO. 1248

I. CONCLUSIONS

A. Trophic Condition:

Survey data and a report by others (Ketelle and Uttormark, 1971) indicate Lake Seminole is eutrophic. It ranked twenty-sixth in overall trophic quality when the 41 Florida lakes sampled in 1973 were compared using a combination of six parameters*. Twenty-six of the lakes had less median total phosphorus, 15 had less median dissolved phosphorus, 21 had less median inorganic nitrogen, 36 had less mean chlorophyll a, and 26 had greater mean Secchi disc transparency.

Survey limnologists noted extensive beds of macrophytes near the shoreline and observed algal blooms in progress at both sampling stations in September and November.

B. Rate-Limiting Nutrient:

The algal assay results indicate Lake Seminole was nitrogen limited at the time the sample was collected (03/08/73). The lake data indicate nitrogen limitation at all sampling stations and times.

C. Nutrient Controllability:

1. Point sources--No known point sources impacted Lake Seminole during the sampling year. Nonetheless, the sampling year phosphorus loading of 1.79 g/m^2/year is over three times that proposed by Vollenweider (Vollenweider and Dillon, 1974)

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* See Appendix A.

as a eutrophic loading; and even though Florida lakes may assimilate phosphorus at a higher level than that suggested by Vollenweider (see page 11), the condition of the lake indicates nutrient loadings are excessive.

2. Non-point sources--The minor tributaries and immediate drainage area contributed an estimated 67.1% of the total phosphorus and 33.9% of the total nitrogen inputs during the sampling year. Long Bayou Creek accounted for 27.0% of the total phosphorus and 55.5% of the total nitrogen loads, and Unnamed Stream B-1 accounted for 3.5% and 5.7%, respectively. Any significant change in the nutrient inputs to Lake Seminole would involve reduction of the loads in these flows.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

A. Morphometry††:

1. Surface area: 1.85 kilometers^2.
2. Mean depth: 2.7 meters.
3. Maximum depth: Unknown.
4. Volume: 4.995 x 10^6 m^3.
5. Mean hydraulic retention time: 128 days.

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Unnamed Stream B-1	1.1	0.01
Long Bayou Creek	18.6	0.24
Minor tributaries & immediate drainage -	14.8	0.20
Totals	34.5	0.45**

2. Outlet -

Unnamed Stream A-1	36.3**	0.45

C. Precipitation***:

1. Year of sampling: 105.5 centimeters.
2. Mean annual: 140.7 centimeters.

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† Table of metric conversions--Appendix B.
†† Jackman, 1976.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes area of lake; inlet flows adjusted to equal outlet flow.
*** See Working Paper No. 175.

III. WATER QUALITY SUMMARY

Lake Seminole was sampled three times during 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from two stations on the lake and from one or more depths at each station (see map, page v). During each visit, a single depth-integrated (near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first visit, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 0.9 meters at station 1 and 1.5 meters at station 2.

The sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR LAKE SEMINOLE
STORET CODE 1248

PARAMETER	1ST SAMPLING (3/ 9/73) 2 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (9/ 4/73) 2 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (11/ 6/73) 2 SITES RANGE	MEAN	MEDIAN
TEMP (C)	24.6 - 24.7	24.6	24.6	27.9 - 28.2	28.1	28.1	24.3 - 24.4	24.3	24.3
DISS OXY (MG/L)	8.3 - 10.0	9.1	9.1	6.4 - 8.0	7.2	7.2	8.0 - 8.4	8.2	8.2
CNDCTVY (MCROMO)	500. - 585.	543.	543.	471. - 490.	484.	490.	469. - 480.	475.	475.
PH (STAND UNITS)	8.2 - 9.1	8.6	8.6	8.8 - 9.0	8.9	9.0	8.6 - 9.1	8.9	8.9
TOT ALK (MG/L)	129. - 129.	129.	129.	107. - 115.	110.	108.	110. - 118.	113.	112.
TOT P (MG/L)	0.194 - 0.236	0.215	0.215	0.221 - 0.253	0.236	0.233	0.199 - 0.296	0.246	0.243
ORTHO P (MG/L)	0.013 - 0.042	0.027	0.027	0.019 - 0.025	0.022	0.021	0.028 - 0.038	0.032	0.031
NO2+NO3 (MG/L)	0.090 - 0.100	0.095	0.095	0.120 - 0.150	0.133	0.130	0.060 - 0.070	0.067	0.070
AMMONIA (MG/L)	0.080 - 0.080	0.080	0.080	0.100 - 0.120	0.110	0.110	0.070 - 0.070	0.070	0.070
KJEL N (MG/L)	1.800 - 1.800	1.800	1.800	2.100 - 2.800	2.500	2.600	2.300 - 3.200	2.900	3.200
INORG N (MG/L)	0.170 - 0.180	0.175	0.175	0.220 - 0.270	0.243	0.240	0.130 - 0.140	0.137	0.140
TOTAL N (MG/L)	1.890 - 1.900	1.895	1.895	2.230 - 2.920	2.633	2.750	2.360 - 3.270	2.967	3.270
CHLRPYL A (UG/L)	75.8 - 124.3	100.0	100.0	138.7 - 141.6	140.1	140.1	12.3 - 119.3	65.8	65.8
SECCHI (METERS)	0.3 - 1.8	1.1	1.1	0.5 - 0.6	0.5	0.5	0.4 - 0.4	0.4	0.4

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
03/09/73	1. Lyngbya sp.	30,000
	2. Raphidiopsis sp.	9,818
	3. Kirchneriella sp.	8,727
	4. Microcystis sp.	6,000
	5. Cyclotella sp.	5,273
	Other genera	15,091
	Total	74,909
09/04/73	1. Dactylococcopsis sp.	29,260
	2. Oscillatoria sp.	26,565
	3. Lyngbya sp.	20,020
	4. Raphidiopsis sp.	9,240
	5. Nitzschia sp.	8,855
	Other genera	42,735
	Total	136,675
11/06/73	1. Pennate diatoms	28,394
	2. Centric diatoms	24,784
	3. Flagellates	24,300
	4. Oscillatoria sp.	23,822
	5. Scenedesmus sp.	9,145
	Other genera	43,314
	Total	153,759

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
03/09/73	1	75.8
	2	124.3
09/04/73	1	138.7
	2	141.6
11/06/73	1	119.3
	2	12.3

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.044	0.256	9.2
0.050 P	0.094	0.256	9.3
0.050 P + 1.0 N	0.094	1.256	20.8
1.0 N	0.044	1.256	14.3

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of Lake Seminole was high at the time the assay sample was collected (03/09/73). Also, the addition of nitrogen alone or in combination with orthophosphorus significantly increased yields while the addition of orthophosphorus alone did not. This indicates nitrogen limitation.

The mean lake inorganic nitrogen to orthophosphorus ratios were 11 to 1 or less at all sampling stations and times, and nitrogen limitation would be expected.

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Florida National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v). Sampling was begun in March, 1973, and was completed in February, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Florida District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using export rates of 150 kg $P/km^2/year$ and 500 kg $N/km^2/year$**. These values were used because land use in the areas drained by the major tributaries is predominately agricultural, but land use in the immediate watershed is predominately urban (i.e., "ZZ" estimates usually are based on measured tributary exports; but because of the differing land use, the exports would not be representative of the "ZZ" area).

The operator of the Largo wastewater treatment plant provided monthly effluent samples and corresponding flow data, but the plant does not affect Lake Seminole. However, the results of analyses of the samples are included in Appendix E for the record.

As far as is known, no point sources impact the lake.

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* See Working Paper No. 175.
** Uttormark, Chapin, and Green, 1974.

A. Waste Sources:

1. Known municipal - None*

2. Known industrial - None

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Unnamed Stream B-1	115	3.5
Long Bayou Creek	895	27.0
b. Minor tributaries & immediate drainage (non-point load)-**	2,220	67.1
c. Known municipal STP's - None	-	-
d. Septic tanks - None	-	-
e. Known industrial - None	-	-
f. Direct precipitation*** -	80	2.4
Total	3,310	100.0

2. Outputs -

Lake outlet - Unnamed Stream A-1 2,830

3. Net annual P accumulation - 480 kg.

* Mead, 1976.
** Uttormark, Chapin, and Green, 1974.
*** Brezonik and Shannon, 1971.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/yr	% of total
a. Tributaries (non-point load) -		
Unnamed Stream B-1	1,245	5.7
Long Bayou Creek	12,090	55.5
b. Minor tributaries & immediate drainage (non-point load) - *	7,400	33.9
c. Known municipal STP's - None	-	-
d. Septic tanks - None	-	-
e. Known industrial - None	-	-
f. Direct precipitation** -	1,075	4.9
Total	21,810	100.0

2. Outputs -

Lake outlet - Unnamed Stream A-1	41,635

3. Net annual N loss - 19,825 kg.

D. Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr
Unnamed Stream B-1	105	1,132
Long Bayou Creek	48	650

* Uttormark, Chapin, and Green, 1974.
** Brezonik and Shannon, 1971.

E. Yearly Loads:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Note, however, that Florida lakes may be able to assimilate phosphorus at a somewhat higher level than that suggested by Vollenweider (Shannon and Brezonik, 1972).

Essentially, Vollenweider's "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m^2/yr	1.79	0.26	11.8	loss*

Vollenweider phosphorus loadings ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Lake Seminole:

"Dangerous" (eutrophic loading)	0.54
"Permissible" (oligotrophic loading)	0.27

* There was an apparent loss of nitrogen during the sampling year. This may have been due to nitrogen fixation in the lake, solubilization of previously sedimented nitrogen, recharge with nitrogen-rich ground water, unknown and unsampled point sources discharging directly to the lake, or underestimation of the minor tributary and immediate drainage load. Whatever the cause, a similar nitrogen loss has occurred at Shagawa Lake, Minnesota, which has been intensively studied by EPA's former National Eutrophication and Lake Restoration Branch (Malueg et al., 1975).

V. LITERATURE REVIEWED

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VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
1201	ALLIGATOR LAKE	0.620	0.260	474.000	87.733	13.100	0.386
1202	LAKE APOPKA	0.102	0.230	484.176	46.611	8.200	0.019
1203	LAKE BANANA	0.660	0.260	482.667	208.600	3.600	0.293
1206	LAKE CRESCENT	0.065	0.130	473.889	10.211	10.200	0.033
1207	DOCTORS LAKE	0.084	0.120	465.555	27.100	10.600	0.028
1208	LAKE DORA	0.102	0.240	482.889	59.978	7.400	0.022
1209	LAKE EFFIE	1.480	0.410	489.000	261.433	15.000	0.950
1210	LAKE GEORGE	0.129	0.165	469.308	35.000	11.000	0.063
1211	LAKE GIBSON	0.167	0.115	470.000	19.675	10.200	0.069
1212	GLENADA LAKE	0.134	0.165	454.167	27.667	14.700	0.072
1214	LAKE GRIFFIN	0.119	0.260	481.333	66.855	6.600	0.038
1215	LAKE HAINES	0.063	0.115	462.667	26.567	10.600	0.014
1217	LAKE HANCOCK	0.772	0.195	483.500	97.900	5.600	0.158
1219	LAKE HORSESHOE	0.034	0.130	459.000	12.067	11.500	0.023
1220	LAKE HOWELL	1.260	0.285	464.000	54.117	9.000	1.175
1221	LAKE ISTOKPOGA	0.039	0.120	464.222	6.594	8.600	0.010
1223	LAKE JESSUP	0.492	0.290	487.000	76.550	7.600	0.288
1224	LAKE KISSIMMEE	0.034	0.145	463.667	24.142	8.800	0.007
1227	LAKE LULU	1.490	1.065	483.000	276.566	14.300	1.030
1228	LAKE MARION	0.044	0.260	468.833	29.967	7.600	0.016
1229	LAKE MINNEHAHA	0.038	0.080	435.000	8.733	7.700	0.012
1230	LAKE MINNEOLA	0.018	0.070	406.333	3.333	7.400	0.009
1231	LAKE MONROE	0.188	0.300	474.555	14.225	10.800	0.128
1232	LAKE OKEECHOBEE	0.063	0.185	472.366	14.524	9.800	0.010
1234	LAKE POINSETT	0.085	0.150	469.000	6.500	10.600	0.051
1236	LAKE REEDY	0.033	0.330	468.500	34.837	10.600	0.008
1238	LAKE SOUTH	0.074	0.130	464.000	23.167	9.000	0.028
1239	LAKE TALQUIN	0.085	0.290	462.167	9.483	14.400	0.031

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
1240	LAKE THONOTOSASSA	0.695	0.095	466.167	37.700	10.200	0.565
1241	LAKE TOHOPEKALIGA	0.246	0.200	472.917	30.633	10.500	0.152
1242	TROUT LAKE	1.110	0.650	472.000	76.967	12.900	0.970
1243	LAKE WEOHYAKAPKA	0.047	0.080	458.667	7.767	8.200	0.011
1246	LAKE YALE	0.027	0.160	441.000	25.367	7.600	0.014
1247	LAKE HUNSON	1.475	0.925	486.667	140.317	12.200	0.852
1248	LAKE SEMINOLE	0.234	0.175	473.833	102.000	8.600	0.026
1249	LAKE LAWNE	2.560	1.350	494.667	84.900	10.400	0.117
1250	LAKE TARPON	0.041	0.070	400.889	6.867	9.000	0.027
1252	LAKE ELOISE	0.486	0.170	465.333	70.233	12.200	0.339
1258	LAKE JESSIE	0.051	0.090	452.667	26.300	10.800	0.011
1261	EAST LAKE TOHOPEKALIGA	0.042	0.070	440.833	5.167	9.400	0.007
1264	PAYNE'S PRAIRIE LAKE (NO	1.260	0.140	476.000	88.200	7.400	1.210

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
1201	ALLIGATOR LAKE	25 (10)	29 (10)	30 (12)	18 (7)	10 (4)	18 (7)	130
1202	LAKE APOPKA	50 (20)	38 (15)	10 (4)	38 (15)	74 (29)	70 (28)	280
1203	LAKE BANANA	23 (9)	29 (10)	20 (8)	5 (2)	100 (40)	23 (9)	200
1206	LAKE CRESCENT	65 (26)	70 (27)	33 (13)	80 (32)	48 (18)	50 (20)	346
1207	DOCTORS LAKE	60 (24)	76 (30)	60 (24)	55 (22)	34 (12)	56 (22)	341
1208	LAKE DORA	53 (21)	35 (14)	18 (7)	33 (13)	90 (35)	68 (27)	297
1209	LAKE EFFIE	5 (2)	10 (4)	3 (1)	3 (1)	0 (0)	10 (4)	31
1210	LAKE GEORGE	45 (18)	54 (21)	48 (19)	43 (17)	23 (9)	43 (17)	256
1211	LAKE GIBSON	40 (16)	81 (32)	45 (18)	70 (28)	48 (18)	40 (16)	324
1212	GLENADA LAKE	43 (17)	54 (21)	85 (34)	53 (21)	3 (1)	38 (15)	276
1214	LAKE GRIFFIN	48 (19)	29 (10)	23 (9)	30 (12)	95 (38)	48 (19)	273
1215	LAKE HAINES	70 (28)	81 (32)	75 (30)	58 (23)	34 (12)	78 (31)	396
1217	LAKE HANCOCK	18 (7)	43 (17)	13 (5)	13 (5)	98 (39)	28 (11)	213
1219	LAKE HORSESHOE	93 (37)	70 (27)	80 (32)	78 (31)	20 (8)	65 (26)	406
1220	LAKE HOWELL	11 (4)	23 (9)	69 (27)	35 (14)	60 (23)	3 (1)	201
1221	LAKE ISTOKPOGA	85 (34)	76 (30)	65 (26)	93 (37)	69 (27)	89 (35)	477
1223	LAKE JESSUP	28 (11)	18 (7)	5 (2)	25 (10)	83 (32)	25 (10)	184
1224	LAKE KISSIMMEE	90 (36)	63 (25)	73 (29)	65 (26)	65 (26)	99 (39)	455
1227	LAKE LULU	3 (1)	3 (1)	15 (6)	0 (0)	8 (3)	5 (2)	34
1228	LAKE MARION	78 (31)	29 (10)	53 (21)	50 (20)	83 (32)	73 (29)	366
1229	LAKE MINNEHAHA	88 (35)	91 (36)	95 (38)	85 (34)	78 (31)	80 (32)	517
1230	LAKE MINNEOLA	100 (40)	98 (38)	98 (39)	100 (40)	90 (35)	93 (37)	579
1231	LAKE MONROE	38 (15)	15 (6)	28 (11)	75 (30)	26 (10)	33 (13)	215
1232	LAKE OKEECHOBEE	68 (27)	45 (18)	40 (16)	73 (29)	53 (21)	89 (35)	368
1234	LAKE POINSETT	58 (23)	60 (24)	50 (20)	95 (38)	34 (12)	45 (18)	342
1236	LAKE REEDY	95 (38)	13 (5)	55 (22)	45 (18)	34 (12)	95 (38)	337
1238	LAKE SOUTH	63 (25)	70 (27)	69 (27)	68 (27)	60 (23)	56 (22)	386
1239	LAKE TALQUIN	55 (22)	20 (8)	78 (31)	83 (33)	5 (2)	53 (21)	294

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
1240	LAKE THONOTOSASSA	20 (8)	85 (34)	58 (23)	40 (16)	48 (18)	15 (6)	266
1241	LAKE TOHOPEKALIGA	33 (13)	40 (16)	38 (15)	48 (19)	40 (16)	30 (12)	229
1242	TROUT LAKE	15 (6)	8 (3)	43 (17)	23 (9)	13 (5)	8 (3)	110
1243	LAKE WEOHYAKAPKA	75 (30)	91 (36)	83 (33)	88 (35)	74 (29)	84 (33)	495
1246	LAKE YALE	98 (39)	58 (23)	90 (36)	63 (25)	83 (32)	75 (30)	467
1247	LAKE MUNSON	8 (3)	5 (2)	8 (3)	8 (3)	16 (6)	13 (5)	58
1248	LAKE SEMINOLE	35 (14)	48 (19)	35 (14)	10 (4)	69 (27)	63 (25)	260
1249	LAKE LAWNE	0 (0)	0 (0)	0 (0)	20 (8)	43 (17)	35 (14)	98
1250	LAKE TARPON	83 (33)	98 (38)	100 (40)	90 (36)	60 (23)	60 (24)	491
1252	LAKE ELOISE	30 (12)	50 (20)	63 (25)	28 (11)	16 (6)	20 (8)	207
1258	LAKE JESSIE	73 (29)	88 (35)	88 (35)	60 (24)	26 (10)	84 (33)	419
1261	EAST LAKE TOHOPEKALIGA	80 (32)	98 (38)	93 (37)	98 (39)	55 (22)	99 (39)	523
1264	PAYNE'S PRAIRIE LAKE (NO	11 (4)	65 (26)	25 (10)	15 (6)	90 (35)	0 (0)	206

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	1230	LAKE MINNEOLA	579
2	1261	EAST LAKE TOHOPEKALIGA	523
3	1229	LAKE MINNEHAHA	517
4	1243	LAKE WEOHYAKAPKA	495
5	1250	LAKE TARPON	491
6	1221	LAKE ISTOKPOGA	477
7	1246	LAKE YALE	467
8	1224	LAKE KISSIMMEE	455
9	1258	LAKE JESSIE	419
10	1219	LAKE HORSESHOE	406
11	1215	LAKE HAINES	396
12	1238	LAKE SOUTH	386
13	1232	LAKE OKEECHOBEE	368
14	1228	LAKE MARION	366
15	1206	LAKE CRESCENT	346
16	1234	LAKE POINSETT	342
17	1207	DOCTORS LAKE	341
18	1236	LAKE REEDY	337
19	1211	LAKE GIBSON	324
20	1208	LAKE DORA	297
21	1239	LAKE TALQUIN	294
22	1202	LAKE APOPKA	280
23	1212	GLENADA LAKE	276
24	1214	LAKE GRIFFIN	273
25	1240	LAKE THONOTOSASSA	266
26	1248	LAKE SEMINOLE	260
27	1210	LAKE GEORGE	256
28	1241	LAKE TOHOPEKALIGA	229

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
29	1231	LAKE MONROE	215
30	1217	LAKE HANCOCK	213
31	1252	LAKE ELOISE	207
32	1264	PAYNE'S PRAIRIE LAKE (NO	206
33	1220	LAKE HOWELL	201
34	1203	LAKE BANANA	200
35	1223	LAKE JESSUP	184
36	1201	ALLIGATOR LAKE	130
37	1242	TROUT LAKE	110
38	1249	LAKE LAWNE	98
39	1247	LAKE MUNSON	58
40	1227	LAKE LULU	34
41	1209	LAKE EFFIE	31

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 - cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR FLORIDA 8/25/75

LAKE CODE 1248 LAKE SEMINOLE

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 36.3

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1248A1	36.3	0.31	0.42	0.65	0.23	0.08	0.20	0.42	1.19	1.13	0.34	0.17	0.23	0.45
1248B1	1.1	0.01	0.01	0.02	0.01	0.00	0.01	0.01	0.04	0.03	0.01	0.01	0.01	0.01
1248C1	18.6	0.17	0.23	0.34	0.11	0.06	0.11	0.25	0.62	0.57	0.14	0.08	0.14	0.24
1248ZZ	14.8	0.14	0.17	0.28	0.08	0.06	0.08	0.20	0.51	0.45	0.11	0.08	0.11	0.19

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 36.3
SUM OF SUB-DRAINAGE AREAS = 34.5

TOTAL FLOW IN = 5.29
TOTAL FLOW OUT = 5.38

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
1248A1	3	73	0.65	18	0.28				
	4	73	0.48	12	0.48				
	5	73	0.01	18	0.0				
	6	73	0.00	14	0.0				
	7	73	0.34	13	0.05				
	8	73	1.50	16	0.71				
	9	73	2.18	14	1.73				
	10	73	0.23	12	0.22				
	11	73	0.40	4	0.45	16	0.14		
	12	73	1.13	13	0.22				
	1	74	0.45	18	0.37				
	2	74	0.10	14	0.07				
1248B1	3	73	0.02	18	0.01				
	4	73	0.01	12	0.01				
	5	73	0.00	18	0.00				
	6	73	0.00	14	0.01				
	7	73	0.01	13	0.01				
	8	73	0.03	16	0.02				
	9	73	0.04	14	0.03				
	10	73	0.01	12	0.01				
	11	73	0.01	4	0.01	16	0.01		
	12	73	0.03	13	0.01				
	1	74	0.01	18	0.01				
	2	74	0.01	14	0.00				

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TRIBUTARY FLOW INFORMATION FOR FLORIDA

8/25/75

LAKE CODE 1248 LAKE SEMINOLE

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
1248C1	3	73	0.45	18	0.22				
	4	73	0.27	12	0.25				
	5	73	0.01	18	0.0				
	6	73	0.04	14	0.14				
	7	73	0.28	13	0.22				
	8	73	0.96	18	0.57				
	9	73	1.47	14	1.13				
	10	73	0.15	12	0.14				
	11	73	0.25	4	0.28	16	0.10		
	12	73	0.71	13	0.14				
	1	74	0.28	18	0.23				
	2	74							
1248ZZ	3	73	0.08	14	0.06				
	4	73	0.21	18	0.13				
	5	73	0.17	12	0.14				
	6	73	0.03	18	0.01				
	7	73	0.04	14	0.10				
	8	73	0.14	13	0.13				
	9	73	0.42	16	0.27				
	10	73	0.57	14	0.45				
	11	73	0.10	12	0.10				
	12	73	0.14	4	0.16	16	0.07		
	1	74	0.34	13	0.10				
	2	74	0.16	18	0.13				
			0.06	14	0.03				

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 75/08/25

124801
27 52 00.0 082 46 45.0
LAKE SEMINOLE
12103 FLORIDA

11EPALES
3

2111202
0005 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/03/09	16 25	0000	24.7	8.3	72	500	8.20	129	0.080	1.800	0.100	0.042
73/09/04	11 30	0000	28.1	7.2	24	471	9.00	115	0.100	2.800	0.120	0.025
73/11/06	10 54	0000	24.3		16	469	8.60	118	0.070	2.300	0.060	0.038
	10 54	0003	24.3	8.0		469						

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/03/09	16 25	0000	0.236	75.8
73/09/04	11 30	0000	0.233	138.7
73/11/06	10 54	0000	0.243	119.3

25

STORET RETRIEVAL DATE 75/08/25

124802
27 50 40.0 082 46 55.0
LAKE SEMINOLE
12103 FLORIDA

11EPALES
3

2111202
0006 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/03/09	16 40	0000	24.6	10.0	12	585	9.10	129	0.080	1.800	0.090	0.013
73/09/04	11 50	0000	28.2	8.0	18	490	9.00	108	0.110	2.100	0.130	0.019
	11 50	0005	27.9	6.4		490	8.80	107	0.120	2.600	0.150	0.021
73/11/06	10 42	0000	24.4		15	480	9.10	110	0.070	3.200	0.070	0.031
	10 42	0002	24.4	8.4		480	8.90	112	0.070	3.200	0.070	0.028

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/03/09	16 40	0000	0.194	124.3
73/09/04	11 50	0000	0.221	141.6
	11 50	0005	0.253	
73/11/06	10 42	0000	0.296	12.3
	10 42	0002	0.199	

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APPENDIX E

TRIBUTARY AND WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 75/08/25

1248A1
27 50 30.0 082 47 00.0
UNNAMED TRIBUTARY
12073 PINELLAS CO HWY
O/LAKE SEMINOLE
ST HWY 694 BRDG JUST E OF SEMINOLE
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/18	09 20		0.011	2.310	0.042	0.026	0.200
73/04/12	18 00		0.010K	2.000	0.036	0.021	0.140
73/05/18	18 00		0.014	3.000	0.048	0.044	0.190
73/06/14	18 00		0.034	3.780	0.063	0.060	0.270
73/07/13	18 00		0.013	2.500	0.028	0.042	0.260
73/08/16	18 00		0.010K	2.100	0.048	0.063	0.180
73/09/14	12 00		0.011	2.300	0.048	0.046	0.155
73/10/12	18 00		0.010K	3.600	0.073	0.058	0.230
73/11/04	09 00		0.950	1.450	0.060	0.760	0.800
73/12/13	18 00		0.020	1.900	0.040	0.044	0.190
74/01/18	18 00		0.008	2.100	0.025	0.035	0.165
74/02/14	18 00		0.032	6.500	0.065	0.035	0.180

K VALUE KNOWN TO BE
LESS THAN INDICATED

25

STORET RETRIEVAL DATE 75/08/25

124881
27 28 30.0 082 28 30.0
UNNAMED TRIBUTARY
12 PINELLAS CO HWY
T/LAKE SEMINOLE
ST HWY 595 BRD ABOUT 1 MI N OF SEMINOLE
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/18	09	35	0.031	2.730	0.048	0.029	0.270
73/04/12	18	20	0.010K	2.520	0.031	0.030	0.230
73/05/18	18	30	0.010K	3.800	0.021	0.078	0.350
73/06/14	18	05	0.012	6.100	0.026	0.087	0.525
73/07/13	18	20	0.066	3.000	0.300	0.294	0.430
73/08/16	18	10	0.010K	2.300	0.032	0.060	0.190
73/09/14	18	00	0.012	1.500	0.037	0.030	0.185
73/10/12	18	15	0.010K	2.800	0.039	0.050	0.170
73/11/16	18	10	0.024	2.900	0.044	0.066	0.300
73/12/13	18	15	0.092	1.500	0.020	0.036	0.135
74/01/18	18	10	0.010K	1.900	0.020	0.028	0.195
74/02/14	18	10	0.036	2.300	0.200	0.100	0.190

K VALUE KNOWN TO BE
LESS THAN INDICATED

29

STORET RETRIEVAL DATE 75/04/25

12480 1
27 53 00.0 082 46 30.0
LONG BAYOU CREEK
12 PINELLAS CO HWY
T/LAKE SEMINOLE
BRDG ON RD 688
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/18	10 00		0.250	1.000	0.115	0.054	0.110
73/04/12	18 30		0.450	1.400	0.115	0.045	0.120
73/05/18	18 50		0.010K	1.000	0.021	0.029	0.070
73/06/14	18 15		0.066	1.050	0.100	0.084	0.135
73/07/13	16 45		0.010K	3.550	0.037	0.042	0.240
73/08/16	18 25		0.115	1.050	0.072	0.078	0.120
73/09/14	18 10		0.260	0.920	0.120	0.100	0.135
73/10/12	18 30		0.058	2.000	0.740	0.360	0.490
73/11/16	18 20		0.208	1.350	0.088	0.072	0.115
73/12/13	18 30		0.440	1.300	0.148	0.044	0.085
74/01/18	18 20		0.490	0.900	0.104	0.048	0.100
74/02/14	18 20		0.460	1.000	0.080	0.050	0.085

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/08/25

1248DA AS1240DA P035000
27 55 00.0 080 46 35.0
LARGO
12073 PINELLAS CO MAP
D/LAKE SEMINOLE
LAKE SEMINOLE
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/05/09	08 00								
CP(T)-			1.200	15.400	3.100	6.200	7.250	4.470	4.500
73/05/09	23 00								
73/06/05	14 45		4.800	5.900	1.800	7.200	7.400	5.000	4.500
73/07/24	11 00		0.860	11.500	2.300	7.400	8.300	4.660	4.360
73/09/06	08 00								
CP(T)-			0.770	18.000		5.300	6.500	4.880	5.030
73/09/06	22 00								
73/10/16	13 45		0.270	24.000	4.800	3.100	7.200	4.800	4.700
73/12/04	14 00		1.400	16.500	3.100	5.500	7.400	5.800	4.600
74/02/18	12 40		0.200	13.000	5.100	6.160	6.800	6.960	5.000
74/03/12	13 30		0.080	14.000	5.000	7.000	8.200	5.100	4.700
74/04/09	13 10		4.000	3.750	3.750	6.300	7.400	6.000	4.730
74/05/09	14 10		2.320	13.000	3.700	7.000	7.900	5.400	4.500
74/06/11	07 00								
CP(T)-			0.280	16.680	5.000	7.700	7.700	4.490	4.290
74/06/12	06 00								
74/07/02	00 00								
CP(T)-			1.440	11.000	1.800	4.200	4.800	7.220	6.990
74/07/03	24 00								
74/08/06	07 00								
CP(T)-			3.000	14.000	1.300	5.000	5.900	5.820	5.610
74/08/07	06 00								